# Computational 3-D Model of the Human Respiratory System

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A comprehensive, morphologically-realistic computational model of the human respiratory system that can be used to study the inhalation, deposition, and clearance of contaminants, while being adaptable for age, race, gender, and health/disease status is under development.
The model includes the nasal, oral, pharyngeal, and laryngeal passages (extrathoracic region), the trachea and main bronchi (upper airways), the tracheobronchial tree, and branching networks through the alveolar region, allowing for nearly any variation of airway geometries and disease status to be studied. The model will provide the ability to study susceptible populations as well as toxic contaminants which cannot be tested on humans, and will provide predictive data where it is currently lacking.

Using de-identified male and female CT data from Pacific Northwest National Labs (PNNL), models have been developed from the nares through the 8$^{th}$ generation in the lung. Custom software which maintains physiological realism of the human data extends the current model to the 23rd generation. The model is capable of steady state nasal or oral inhalation/exhalation, and particle deposition, and is being modified for dynamic movement of internal lung surfaces while tracking particle inhalation, deposition, and exhalation. Internal nasal and oral structures are modifiable to match facial characteristics. Incorporation of mucociliary action and clearance mechanisms is planned for next year.